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EXAMINER
HAJNIK, DANIEL F

ART UNIT	PAPER NUMBER
2628	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/685,606	**Applicant(s)** HONG ET AL.
	Examiner Daniel F. Hajnik	**Art Unit** 2628

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-80* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-43,57,60-62,64,65,67,68,70 and 73-80* is/are rejected.

7)☒ Claim(s) *44-56,58,59,63,66,69,71 and 72* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 1-39, 75, 79, and 80 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-39, and 75 appear to be directed to an abstract idea rather than a practical application of the idea. These claims do not result in a physical transformation nor does it appear to provide a useful, concrete, and tangible result. Specifically, it does not appear to produce a tangible result because merely "processing", "testing", and "generating" are nothing more than thoughts or computations within a processor. It fails to use or make available for use the result of the method to enable its functionality and usefulness to be realized. Additionally, the asserted practical application in the specification is rendering a computer graphics image. The practical application is not explicitly recited in the claims nor does it flow inherently therefrom.

Claim 79 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter, a storage medium, which can be an electro magnetic signal (i.e. see specification pg. 11, lines 20-25). Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. Moreover, it does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in § 101.

Claim 80 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter, electro-magnetic signals. Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. Moreover, it does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in § 101.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4, 21-23, 25, 26, 28, 29, 31, 34, 40-43, 60-62, 64, 65, 67, 68, 70, 73, and 75-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cignoni et al. (NPL Document "*Preserving attribute values on simplified meshes by resampling detail textures*", herein referred to as "Cignoni").

As per claim 1, Cignoni teaches the claimed:

> three-dimensional mesh of planar triangles representing the surface shape of a three-dimensional object

in figure 1 where the figure has an original mesh and a mesh simplifier which simplifies a mesh which represents surface shape of a three-dimensional object. Cignoni further teaches of planar triangles in figure 14(b).

Cignoni teaches the claimed:

> Generating a texture coordinate map

By teaching of:

> *The last step of our algorithm is to pack all the triangular* ***texture patches into a single rectangular 2D texture****.*
> (p. 527, § 3.4, ¶ 1)
> (section 3.4, 1st paragraph)
> (emphasis added here and below to various quotations)

and in figure 11a on page 530. Here, in this figure, triangular patches located next to each other, which are similar in size, represent each respective list. For example, in figure 11a the largest triangles are located on the top left portion of the texture map and thus represent a list of large triangles. Further, small triangles are located towards the bottom right portion of the texture map and thus represent a list of small triangles.

Cignoni does not explicitly teach the claimed:

> Testing the triangles in the mesh to generate a plurality of triangle lists

Cignoni suggests the claimed limitation by teaching of:

> *We adopted a bucket representation of the faces of M [1]...* ***Pointers to the faces contained/intersected are stored in each bucket****. For each point p, we test faces of M in order of distance from p, stopping the process as soon as no more buckets closer than the nearest face exist.*

> (p. 522, § 3.1, ¶ 2)
>
> *Buckets are processed in order of height (tallest first)*
> (p. 527, § 3.4, ¶ 5)
>
> ***At each step**, given the left-most open edge, **we scan the list of patches** to find the one with the best matching slope*
> (p. 527, § 3.4, ¶ 5)

Here, M[1] represents the mesh. It would have been obvious to one of ordinary skill in the art at the time of invention to use the claimed triangle lists because Cignoni teaches of organizing faces (triangles) according to buckets, which are similar to lists, and processes these buckets according to height. One advantage for utilizing the claimed triangle list structure instead of a bucket structure is that the triangle list fits well with linear memory structures, such as dynamic arrays and linked lists, and can be easier to implement in code.

As per claim 2, Cignoni teaches the claimed the limitations by teaching of in figures 8 and 10 of packing adjacent triangles together in a two-dimensional area according to the size of the triangles. Cignoni further teaches the claimed limitations by teaching of:

> At each step, given the left-most open edge,
> **we scan the list of patches to find the one with the best matching slope**
> (p. 527, § 3.4, ¶ 5)

Here, the reference is finding the best matching slope for packing the triangles together.

In addition, Cignoni teaches of packing triangles without padding by teaching of:

> *shearing each texture patch along the x-axis, in ordre to reduce text_gaps ... the more we shear, **the less texture space is wasted***
> (p. 527, § 3.4, ¶ 6)

As per claim 3, Cignoni does not explicitly teach the claimed limitations because Cignoni does not explicitly teach of triangle list, however, Cignoni suggests the claimed limitation by teaching of:

> *We adopted a bucket representation of the faces of M [1]...*
> ***Pointers to the faces contained/intersected are stored in each bucket.***
> (p. 522, § 3.1, ¶ 2)
>
> ***Patches are divided into different buckets, one for each different patch height*** *(2^i texels). Buckets are processed in order of height (tallest first).*
> (p. 527, § 3.4, ¶ 5)

Here, patches, divided into different buckets, suggest dividing triangle lists into different heights (a geometric criterion). One advantage for utilizing the claimed triangle list structure instead of a bucket structure is that the triangle list fits well with array memory structures and can be easier to implement in code.

As per claim 4, Cignoni teaches the claimed limitations by teaching of:

> *For each mesh face, we are free to rotate it to select the best matching height.* ***The criterion is*** *to select the "rotation" of the face such that, once we have enlarged its height to the nearest 2^i discrete size,* ***the corresponding discrete surface will be the minimal one*** *of the three possible rotations.*
> (p. 527, § 3.4, ¶ 4)

Here, the minimal change is height can result in a minimum distortion.

As per claim 21, Cignoni teaches the claimed limitations by teaching of:

> *For each mesh face, we are free to rotate it* ***to select the best matching height****. The criterion is to select the "rotation"*

> *of the face such that, once we have* ***enlarged its height to the nearest 2i discrete size****, the corresponding discrete surface will be the* ***minimal one*** *of the three possible rotations.*
> (p. 527, § 3.4, ¶ 4)

Here, by minimizing distortions for the triangles, as shown in figure 11, on the texture coordinate map will have the same relative sizes (as thus area as well) as the triangles faces they represent on the mesh.

As per claim 22, Cignoni teaches the claimed limitations in figures 8 and 10 where the texture-coordinate map shows lists of triangles with the same height. Here, the lists of triangles are shown as similarly sized triangles located next to one another in the form of strips.

As per claim 23, Cignoni teaches the claimed limitations by teaching of:

> ***Patches are divided into different buckets****, one for each different patch height (2^i texels).* ***Buckets are processed in order of height (tallest first)****.*
> (p. 527, § 3.4, ¶ 5)

Here, the reference indicates that each respective list of triangles is processed according to height. This is further seen in figure 8 and 10 (in the picture towards the right in each case), where the processing starts near the upper, left corner, and each respective list of triangles is processed in turn according to height.

As per claim 25, Cignoni teaches the claimed limitations by teaching of in figures 8 and 10, a texture coordinate map in a two-dimensional area where each strip (a strip of like-sized triangles) is shown. Further, figures 8 and 10 show that each strip can have the same length by completely filling a row of the given texture coordinate space. In these figures, the same length can be achieved by placing empty space at the end of uncompleted strips.

As per claim 26, Cignoni teaches the claimed:

> Defining a first rectangular strip and defining triangles in the first strip for complete triangle lists until the triangles of no further complete triangle lists will fit into the first strip

In figures 8 and 10 where the picture on the right, in both respective figures, shows the top row is a first rectangular strip. These large triangles in the top row (first rectangular strip) have connected the complete list of triangles until no further large triangles will fit into the first strip.

Cignoni teaches the claimed:

> Defining a second rectangular strip adjacent the first strip and defining triangles in the second strip for complete triangle lists until the triangles of no further complete triangle lists will fit into the second strip

In figures 8 and 10 where the picture on the right, in both respective figures, shows the large triangles in the top row (first rectangular strip) have connected the complete list of triangles until no further large triangles will fit into the first strip. Then, subsequently, the large triangles continue to the next row (a second rectangular strip) below the first row (an adjacent row and also the first strip).

Cignoni teaches the claimed:

> Repeating the process to define a rectangular strip adjacent the previous strip and defining triangles in the strip for complete triangle lists until the triangles of no further complete triangle lists will fit therein, until a respective triangle has been defined in a rectangular strip for each triangle in the mesh

In figures 8 and 10 where the picture on the right, in both respective figures, shows a complete set of triangles (of all sizes) in a plurality of strips. Cignoni further teaches the claimed limitation by teaching of:

> *The original contribution is that preservation is performed after simplification* ***by building a set of triangular texture patches that are then packed into a single texture map****.*
> (abstract)

Here, the reference teaches that all triangular texture patches are packed into strips to make a single texture map (the single texture map as shown in figure 11a).

As per claim 28, Cignoni teaches the claimed:

> defining a respective triangle in the strip for each triangle in a first triangle list so that the defined triangles in the strip are in the sequential order defined by the first list;

In figures 8 and 10 where the picture on the right, in both respective figures, shows in the top row a strip of respective triangles where the lists are organized according to size. The top row of the figure shows large triangles laid out according to the sequential order of large triangles as the first bucket (first list) was originally formed (see p. 527, § 3.4, ¶ 5).

Cignoni teaches the claimed:

> testing a further triangle list to determine whether triangles defined therefor will fit in the area remaining within the strip;

By teaching of:

> *Texture patches packing.* ***All triangular patches are packed*** *(and stored) in a standard, rectangular texture*
> (p. 522, paragraph right before § 3.1)

Here, and as also shown in figures 8 and 10, the triangles are placed in strips until there is no longer enough room to fit another triangle in the strip (testing for enough space). Once, the strip has no more room for the next triangle, the process continues on the next strip (next row).

Cignoni teaches the claimed:

> defining a respective triangle in the strip for each triangle in the further triangle list if it is determined that the triangles will fit within the remaining area, otherwise testing another triangle list to determine whether triangles defined therefor will fit into the area remaining within the strip;

in figure 8, where in the second strip there is shown to be remaining space after the largest triangles (from a first list) have been defined. Thus, another list of smaller triangles are defined in the remaining area of the strip.

Cignoni teaches the claimed:

> repeating the processing to test triangle lists and define triangles in the strip until the strip is full or until all triangle lists have been tested

in figures 8 and 10 where all the triangular lists (triangle bucket sizes) have been tested and defined into strips.

As per claim 29, Cignoni teaches the claimed limitations by teaching of:

> *For each mesh face, we are free to rotate it* ***to select the best matching height****. The* ***criterion is to select*** *the "rotation" of the face such that, once we have enlarged its height to the* ***nearest*** 2^i ***discrete size,***
> (p. 527, § 3.4, ¶ 4)

Here, the reference is determining whether the heights of the triangles and the height of strip satisfy a predetermined relationship (where the relationship is matching a best height to the strip). Cignoni further teaches the claimed limitations by teaching of splitting into sub strips in figures 8 and 10 where on the second row, multiple new, smaller rows are created after all the large triangles have been placed. Thus, these new smaller rows are the strips splitting into sub strips. Further, the figure indicates that the triangles have been "packed" through testing to find where the triangles can be fit in the texture map.

As per claim 31, Cignoni teaches the claimed limitations by teaching of:

> ***Buckets are processed in order of height (tallest first). Initially, the first open edge is aligned to the left border*** *of the empty texture, and is equal in size to the tallest bucket.*
> (p. 527, § 3.4, ¶ 5)

Cignoni further teaches the claimed limitations by teaching of splitting into sub strips in figures 8 and 10 where the new smaller rows (the new sub strips) are the same height as the triangular sections contained in those strips.

As per claim 34, Cignoni teaches the claimed:

> Each rectangular strip is defined to have the same length as the predefined width or predefined height of the two-dimensional area

By teaching of in figures 8 and 10 a texture coordinate map in a two-dimensional area where each strip (a strip of like-sized triangles) can fill up an entire length of the two-dimensional area. Further, in these figures, the same length can be achieved for other strips by placing empty space at the end of uncompleted strips.

Cignoni does not explicitly teach the claimed:

> The processing to define strips and to define triangles therein is repeated a plurality of times, each time using a different scaling factor to define the strip heights, until all of the strips fit within the predefined area

Cignoni suggests the claimed limitation by teaching of packing triangles without padding by teaching of:

> *shearing each texture patch along the x-axis, in ordre to reduce text_gaps ... the more we shear, the less texture space is wasted*
> (p. 527, § 3.4, ¶ 6)

According to figures 8 and 10, if all the padding is removed through shearing (scaling in a given direction) then the strips will fit completely within the predefined width and height of the area.

As per claims 40-43, 60-62, 64, 65, 67, 68, 70, and 73, these claims are similar in scope to claims 1-4, 21-23, 25, 26, 28, 29, 31, and 34, respectively, and thus are rejected under the same rationale.

As per claims 75-78, these claims are similar in scope to claim 1, and thus are rejected under the same rationale.

3. Claims 18, 35-39, 57, 74, 79, and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cignoni in view of Dalal et al. (US Patent 6362819, herein referred to as "Dalal").

As per claim 18, Cignoni teaches the claimed:

> Testing the initial triangle lists to identify lists which can be concatenated … satisfying at least one second predetermined geometric criterion
>
> Concatenating the identified triangle lists

By teaching of:

> *We then proceed by* ***iteratively selecting among all the patches in the current bucket*** *the one* ***whose slope is the most similar*** *to the current open edge*
> (p. 527, § 3.4, ¶ 5)

Here, the second predetermined geometric criterion is the slope, which is later used for packing the triangles into the texture coordinate map. Further, the actual concatenation is shown in figure 9 where the strips of triangles shown have concatenated lists where the triangles are concatenated (or joined) according to slope.

Cignoni does not explicitly teach the claimed:

> Generating a plurality of initial triangle lists … satisfying at least one first predetermined geometric criterion

Dalal teaches the claimed limitation by teaching of:

> ***breaking up the surface geometries to make surface geometry fragments*** *that match the texture fragments contained in the texture fragment list (block 102 of FIG. 3) and* ***reconstitute the mesh of polygons, i.e., the triangles,*** *that define the surface geometries*
> (col 8, lines 30-35)
>
> *an array of triangles*
> (col 8, line 44)
>
> *The newly created smaller triangular elements are saved*
> (col 8, lines 56-57)

Here, the list of triangles (an array of triangles) is generated by adding new triangles to the list where the additions satisfy the geometric criterion that the triangle list generated match the texture fragments.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Cignoni and Dalal. Dalal teaches one advantage of the combination by teaching of:

> *As will be readily appreciated from the foregoing summary, the invention provides* ***a new and improved method****, apparatus and computer-readable medium* ***for tessellating textures and mapping the resulting texture fragments onto the geometric surfaces of a three-dimensional model***
> (col 4, lines 10-12)

where Cignoni would benefit from the added functionality in terms of surface tessellation.

As per claims 35-39, Cignoni does not explicitly teach the claimed limitations. Dalal teaches the claimed “signal”, “recording”, and “processing” by teaching of:

> *Input/output system (BIOS) ... helps to transfer information between elements*
> (col 4, lines 34-36)
> (Transferring using a signal)
>
> *Reading from or writing to a hard disk*
> (col 4, line 38) (Recording)
>
> *a processing unit*
> (col 4, line 26)(Processing)

One advantage to the claimed limitations is that these technologies are readily available and well recognized techniques for implementing texture mapping and rendering using a computer system.

As per claims 57 and 74, these claims are similar in scope to claims 18 and 37, and thus are rejected under the same rationale.

As per claim 79, Cignoni does not explicitly teach the claimed "storage medium". Dalal teaches the claimed limitations by teaching of "*computer-readable media*" (col 4, line 53). One advantage to the claimed limitation is that this technology is readily available and a well recognized technique for implementing texture mapping and rendering using a computer system. Please note, in this case, the examiner is treating this multi-dependent claim in one of its broadest forms as being dependent upon claim 1.

As per claim 80, this claim is similar in scope to claim 35, and thus is rejected under the same rationale. Please note, in this case, the examiner is treating this multi-dependent claim in one of its broadest forms as being dependent upon claim 1.

Allowable Subject Matter

4. Claims 44-56, 58, 59, 63, 66, 69, 71, and 72 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The following prior art made of record and relied upon is considered pertinent to applicant's disclosure: U.S. Patent Application Publication No. 2003/0206165

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel F. Hajnik whose telephone number is (571) 272-7642. The examiner can normally be reached on Mon-Fri (8:30A-5:00P).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka J. Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Daniel Hajnik 9/13/06

DFH

ULKA CHAUHAN
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